

# PROJECT facts

DEPARTMENT OF ENERGY  
OFFICE OF FOSSIL ENERGY  
FEDERAL ENERGY TECHNOLOGY CENTER

ADVANCED CLEAN/EFFICIENT  
**POWER systems**

PS003.0697

## CONTROLLING AIR TOXICS WITH ELECTROSTATIC PRECIPITATORS

### Project Description

Utilities in the United States have been forced to reduce environmental impacts by legislation, and further restrictions are expected within the next 10 years. Pending increased regulations for air toxics control, ABB is evaluating technologies to improve control of the emissions of fine particulates (particles smaller than 10 microns), and thus to reduce the emissions of associated hazardous air pollutants.

Fine particulates are collected from flue gas in coal-based electric utilities with the use of electrostatic precipitators (ESPs), which remove particles in the gas stream by electrostatic charging and subsequent precipitation. Nearly 90% of U.S. coal-based electric utilities use ESPs to collect fine particulates.

The ABB project is developing and evaluating four technologies to enhance the collection of fine particulates by ESPs:

- ABB Proprietary Designed Precharger—charges particulates before they enter the ESP, enhancing the collection of particulates.
- ABB Wet ESP—collects finer particulates than do existing technologies; also collects aerosols.
- Gas Cooling Upstream of the ESP—increases the residence time in the collection area and decreases resistivity, which enhances fine-particulate collection.
- Switched Integrated Rectifier, a new Transformer/Rectifier Set—allows flexible setting of voltage and current characteristics to enhance fine-particulate collection.

A versatile, pilot-scale test facility located at ABB Power Plant Laboratories has been used to investigate and demonstrate these technologies. The facility enables testing under different flue gas conditions typical of coal-based electric utilities.

Under a Phase II test program scheduled to begin in October 1997, the most promising technologies will be field-tested on a larger scale.

### Program Goal

Coal represents 94% of proven U.S. fossil fuel reserves, but burning coal to generate energy produces potentially harmful emissions. It is in our national interest to make use of this plentiful domestic energy source with minimal adverse impact on the environment and human health. The ABB project supports the goal of the Advanced Power Systems Program by investigating highly efficient, affordable technologies that further the use of coal as a reliable, low-cost energy source, while meeting or exceeding pending environmental regulations.

### PRIMARY PROJECT PARTNERS

**ABB Combustion Engineering (CE), Inc.**  
Windsor, CT

**ABB Power Plant Laboratories**  
Windsor, CT

**ABB Environmental Systems**  
Knoxville, TN

### MAIN SITE

**ABB Power Plant Laboratories**  
Windsor, CT

### TOTAL ESTIMATED COST

**\$2,794,795**

### COST SHARING

<b>DOE</b>	<b>\$1,985,049</b>
<b>Non-DOE</b>	<b>\$809,746</b>

# CONTROLLING AIR TOXICS WITH ELECTROSTATIC PRECIPITATORS

## Project Benefits

Reducing the emissions of fine particulates and potentially hazardous air pollutants can help utilities meet tightening air-quality standards. The ABB project explores and demonstrates how utilities can comply with environmental regulations in a cost-effective manner by developing retrofit technologies that enhance rather than replace existing processes.

With direct application to the electrostatic precipitation processes used by nearly 90% of currently operating utilities, the technologies investigated by the ABB project have the potential to reduce fine-particulate emissions, the air toxics associated with these fine particulates, and vapor-phase air-toxics emissions.

Another major benefit of the ABB project is that test results are expected to be directly applicable to plant conditions, since ABB's testing facility can simulate different flue gas conditions typical of coal-based electric utilities.

The enhancements will improve the collection efficiency of older ESPs and plants intending to switch to low-sulfur coals. They also can reduce reintroduction of previously collected particles into the gas stream.

ABB has demonstrated that fine particle emissions across the ESP are reduced by a factor of 10 to 15 compared to when employing the switched (Integrated Rectifier with humidification (flue gas cooling)).

## CONTACT POINTS

### Michael Rini

ABB Combustion Engineering, Inc.  
Windsor, CT  
(860) 285-2081  
(860) 285-3861 fax  
michael.j.rini@usppl.mail.abb.com

### Thomas D. Brown

U.S. Department of Energy  
Federal Energy Technology Center  
Pittsburgh, PA  
(412) 892-4691  
(412) 892-5917 fax  
brown@fetc.doe.gov

## Project Partners

### ADA TECHNOLOGIES INC.

Englewood, CO  
(technical expertise)

## Cost Profile

(Dollars in Thousands)

Department  
of Energy\*

Private Sector  
Partners

Prior Investment	FY95	FY96	FY97	Future Funds
—	\$285	\$105	\$146	\$1,449
—	\$100	\$360		\$350

\* Appropriated Funding

## Key Milestones

FY96				FY97	
Design & Construction				Testing	
			Construction completed; testing begins 6/96		Final report 9/97
		Design completed 4/96			
		Construction begun 2/96			Phase II selection 10/97
	Design begun 12/95				
Contract awarded 10/95					